# The Asthma Management Program

# as a Predictor of Emergency Room Visits and Hospitalizations

# at David Grant USAF Medical Center

Major Patricia Hughes

US Army-Baylor University

Graduate Management Project

| REPORT DOCUMENTATION PAGE | Form Approved OMB No. 0704-0188 |
|---|---|



| 1. AGENCY USE ONLY *(Leave blank)* | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
|---|---|---|
| | August 1998 | FINAL REPORT (07-97 TO 07-98) |

**4. TITLE AND SUBTITLE**
The Asthma Management Program As A Predictor of Emergency Room Visits and Hospitalizations At David Grant USAF Medical Center

**5. FUNDING NUMBERS**

**6. AUTHOR(S)**
Major Patricia (NMI) Hughes, USAF, NC

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**
David Grant USAF Medical Center
Travis AFB, CA 94535

**8. PERFORMING ORGANIZATION REPORT NUMBER**
33b-98

**9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)**
US ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
BLDG 2841 MCCS-HRA US ARMY-BAYLOR PROGRAM IN HCA
3151 SCOTT RD SUITE 1412
FORT SAM HOUSTON TEXAS 78234-6135

**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**

**11. SUPPLEMENTARY NOTES**

**12a. DISTRIBUTION AVAILABILITY STATEMENT**
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

**12b. DISTRIBUTION CODE**

**13. ABSTRACT** *(Maximum 200 words)*

The purpose of this non-randomized retrospective study of the population (0-30 years of age) was to see the impact of the David Grant Medical Center asthma management program on the number of ER visits and hospitalizations for asthma and asthma related causes. Data collection was conducted in two phases to insure the database included at least 12 months of follow-up data from the initial class date. The investigator developed two linear regression models with ER visits and hospitalizations as outcome variables; and age, gender, rank of sponsor, and level of participation as the predictor variables. In the ER model, only the participation variable was statistically significant with a $p < .0001$ and an R-square of .20. Results indicate greater participation in the program is related to fewer number of ER visits and hospitalizations for asthma. Disease management initiatives, such as the DGMC asthma management program should become the primary design of care delivery to improve patient outcomes and reduce the cost associated with ER visits and hospitalizations.

| 14. SUBJECT TERMS | 15. NUMBER OF PAGES |
|---|---|
| Asthma Disease Management | 35 |
| | 16. PRICE CODE |

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
|---|---|---|---|
| N/A | N/A | N/A | UL |

# ACKNOWLEDGMENTS

No research project ever becomes a reality without the dedication and commitment to excellence of special colleagues and friends. First and foremost, I wish to thank Dr. Anneke Bush for her analytical guidance and endless patience throughout the residency year. I also would like to express my appreciation to Dr. Kris Hoffman for being such an enthusiastic champion for asthma disease management and wholeheartedly supporting my every request along the way. In addition, I am forever indebted to my husband Dan, for believing in my abilities and rescuing me from my technical misadventures no matter the hour of the day or night. These three very special individuals devoted countless hours to secure the success of this academic endeavor and more importantly, made the year a meaningful and enjoyable one to remember.

Table of Contents

Introduction ----------1

Methodology----------17

Results ----------20

Discussion----------25

Conclusions and Recommendations----------29

Appendices----------31

References----------32

# List of Tables

Table 1. Descriptive Statistics

Table 2. Testing Significance for ER Visits

Table 3. Testing Significance for Hospitalizations

Table 4. Inferential Statistics

# List of Figures

Figure 1. National Asthma Prevalence Rate.

Figure 2. National Asthma Costs, 1990.

Figure 3. Preliminary Results of the DGMC Asthma Program..

Figure 4. Demographic Characteristics of the DGMC Asthma Population.

Figure 5. Non-Participants by Rank of Sponsor.

Figure 6. ER Visits and Hospitalizations in the DGMC Asthma Population Age 0-17.

Figure 7. ER Visits and Hospitalizations in the DGMC Asthma Population Age 18-30.

# Introduction

Throughout its evolution, managed care has introduced new concepts and incentives aimed at reducing health care costs while maintaining or improving quality of care. The traditional focus on individual episodes of care has helped achieve some efficiencies, but case management, for example, suggests only modest potential for effecting change over the long term (Todd & Tinkelman, 1996; Plocher, 1996). Despite these recent successes in cost containment, economic pressure from government and other payers continues to intensify. These forces dictate that health care providers fundamentally rethink healthcare delivery and management.

A number of health care organizations to include the Military Health System (MHS) have moved to the forefront of managed care with a far-reaching alternative to the focus on episodic care. Known as "disease management," this alternative views the patient in a broader perspective that is, the patient is at the center of population health management, a process that integrates accreditation, performance, and outcomes measurement.

Plocher (1996) defines disease management as a prospective disease-specific approach to delivering health care over the continuum of care by augmenting the physician's visits with interim management through non-physician practitioners specializing in the target disease. Disease management redirects the intervention efforts toward the outpatient setting for several chronic disorders and captures information from all encounters of care for each patient with that disorder into a single longitudinal continuum. As a result of this longitudinal perspective, patients are tracked continuously,

thereby adding new opportunities for patient education other than at the hospital or physician's office. This approach allows a more prospective approach to managing a disease, improving the likelihood that exacerbation of the disease can be prevented or reduced in frequency or severity.

The importance of disease management will only grow as managed care organizations implement the Health Plan Employer Data and Information Set (HEDIS), and other "report-card" systems, to prepare for accreditation by the National Committee for Quality Assurance. The HEDIS performance measures, which include asthma hospital admission and readmission rates for pediatrics, represent the first attempt by managed care organizations to measure and improve management of asthma and other diseases (Todd & Tinkelman, 1996). Industry concern over these report-card systems has helped fuel interest in asthma as a prime candidate for disease management initiatives. According to the 1995 HMO Industry Report, more than 61% of HMOs had developed asthma management programs. More than 75% of the HMOs report reduced utilization, ER visits and hospital admissions after implementing initiatives.

Lovelace Healthcare Innovations, Inc. summarizes disease management as a prevention focused approach to healthcare delivery that is integrated across the entire care spectrum through information management that measures and improves processes and outcomes that are clinical, humanistic, or cost oriented. As such, organizations and health care practitioners who adhere to the principles of disease management will be in the best position to thrive in the cost-driven health care marketplace.

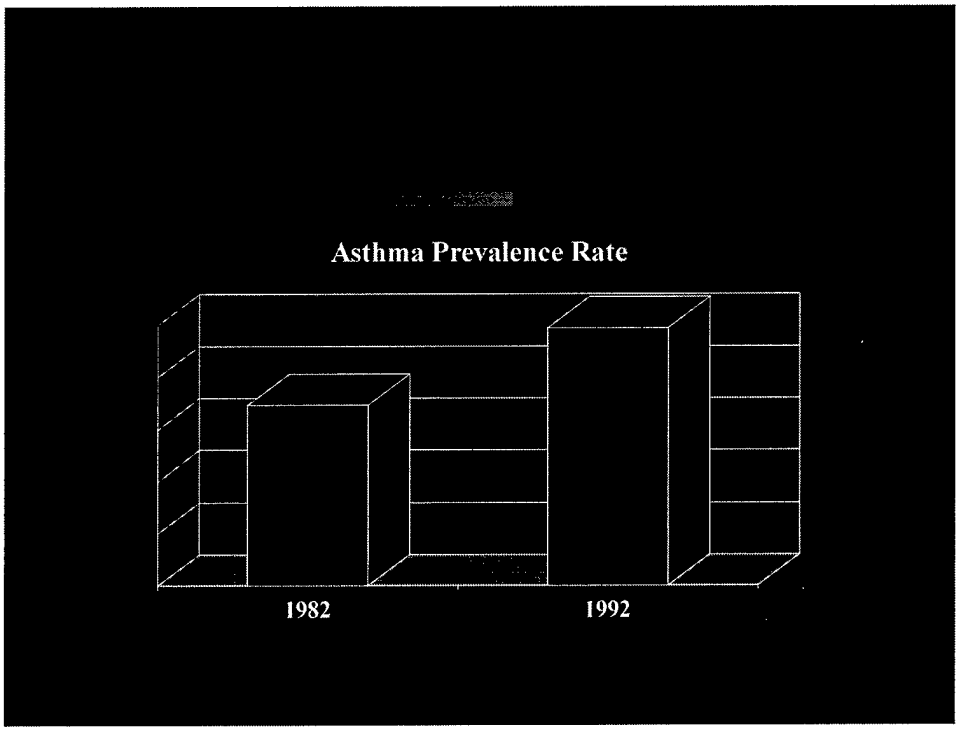


Figure 1. National Asthma Prevalence Rate

Impact of Asthma

Asthma is a chronic, inflammatory disease that severely affects the quality of life. It affects approximately 5% of the U.S. population or nearly 12 million Americans, including 4 million children (NIH, 1992; Carr, Zeitel & Weiss, 1992).

Although most people with asthma never experience a life-threatening attack, the incidence of fatal asthma is increasing. According to a study conducted by the Centers for Disease Control and Prevention, the incidence of asthma cases in the U.S rose 42% in a decade (see Figure 1). The mortality rate in that same period jumped 40%, an especially disturbing number given the variety of effective treatments available for the disease. This trend may reflect a change in asthma prevalence and severity, inadequate or delayed treatment, and/or better recognition and reporting (Weiss et al.,1993).

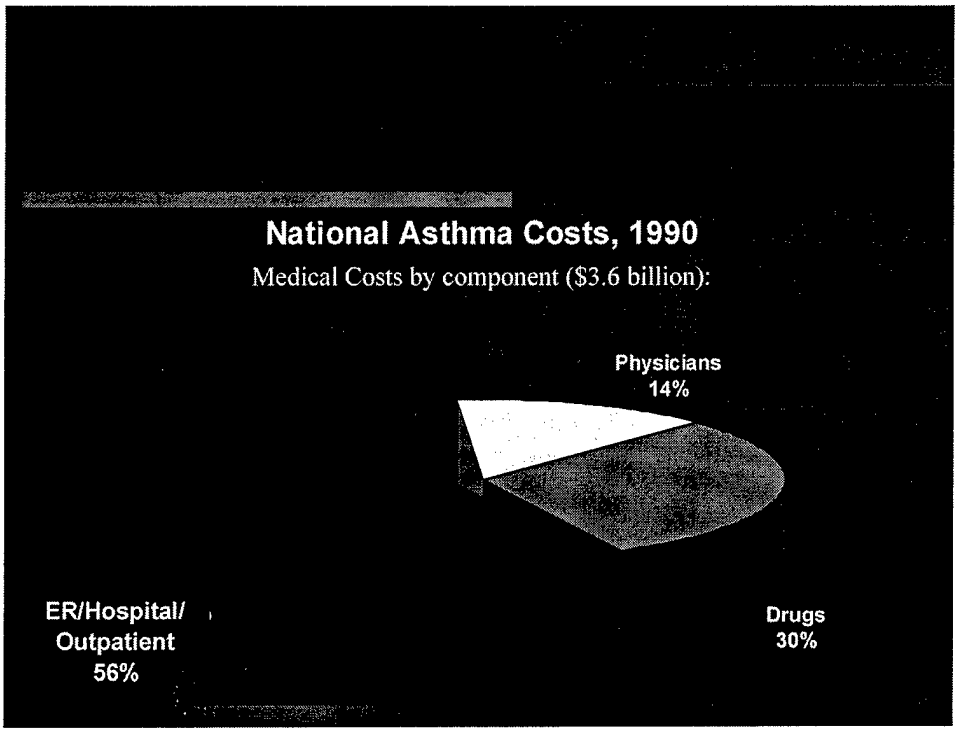


Figure 2. National Asthma Costs, 1990

Weiss (1992) reported that hospitalizations and ER visits account for 56% of all asthma-related costs (see Figure 2). The largest single component of direct asthma costs was inpatient hospital services. About 1% (6.5 million) of the 640 million ambulatory visits to physicians made per year resulted in a primary diagnosis of asthma (NIH, 1991).

The economic value of reduced productivity due to asthma symptoms and lost school days and workdays represents the largest single indirect cost of asthma. One study estimates that asthma patients who work in jobs outside the home and spend more than 8 days per month working at reduced capacity due to asthma symptoms. The calculated cost of lost productivity per worker is $1,033---or $4.4 billion for the entire working asthma patient population (Sullivan et al., 1996).

In addition, children missed more than 10 million school days per year due to asthma. The impact of lost school days is not only felt in school days but also in the workplace. Parents and caretakers who take time off from work to care for children with asthma cost $899.7 million per year in lost productivity (Weiss et al., 1992).

Mortality is also a component of indirect asthma costs. The time lost from work as a result of premature death is estimated at $819.3 million in lost earnings (Weiss et al., 1992). Aside from the direct and indirect costs, the psychosocial impact of the disease on the individual and family is substantial.

Asthma in Brief

Asthma symptoms (primarily cough, chest tightness, and wheezing) differ greatly in frequency and degree. Although the underlying obstructive mechanisms are still unclear, asthma can be effectively controlled in most patients, but it cannot be cured (National Asthma Education Program Expert Panel Report, 1997).

Inflammation of the lining of the airways is the most common feature of asthma. Although causes are not well known, several "triggers," some of which have been identified from the indoor environment cause the lungs to overreact, becoming increasingly inflamed and clogged with. When triggered by a stimulus, such as dust mites, cat dander or molds, certain cells lining the airways release chemical substances (called mediators) that lead to inflammation ("Managing Asthma,"1995). This causes the airway lining to swell and narrows the airway opening. The inflammation and swelling can last for weeks after an episode. In fact, most asthmatics have some level of inflammation all the time.

Another important aspect of asthma is the increased sensitivity of the airways. This hyperreactivity leads to bronchospasm , a spasm of the bronchial muscle that further narrows the airways (Management of asthma, 1996).

In some asthmatics, the mucous glands in the airways produce excessive, thick mucus, causing more obstruction. Corticosteroid medications help reduce swelling and, therefore, mucus production (Grammer, 1992).

Asthma pharmacotherapy

A primary goal in the management of asthma is to prevent the development of severe airway obstruction (Grammer, 1992). This could be accomplished by prescribing a short course of oral steroids to an asthmatic patient who has developed a viral upper respiratory infection so as to prevent any further aggravation of the condition.

Asthma drugs are classified as bronchodilators or anti-inflammatory drugs (Grammer, 1992). A newer classification system divides them into "controllers" and relievers to enhance patient understanding and teaching (NHLBI, 1995).

Controllers are chronic medications taken daily that are useful for keeping persistent asthma under control. Anti-inflammatory agents and long-acting bronchodilators are included in this category. The inhaled corticosteroid anti-inflammatory agents are now the most effective controllers.

Relievers include short-acting bronchodilators that act quickly to relieve bronchoconstriction and its accompanying acute symptoms such as cough, chest tightness, and wheezing. They are considered quick relief medicines or rescue medicines.

Even though the onset of action is 4 to 6 hours, systemic corticosteroids are

important in the treatment of acute severe exacerbation's because they prevent progression, decrease the need for emergency room visits or hospitalizations, prevent relapse, and reduce the morbidity of the illness (NHLBI, 1995).

Conditions Which Prompted the Study

The DoD Civilian External Peer Review Program recently released the first of a two-part study on the treatment of pediatric asthma in 11 Department of Defense (DoD) medical treatment facilities (MTFs). The report showed that asthma discharge rates appear higher in the MHS than for the nation as a whole. The consultants found most of the inpatients were treated according to the National Heart, Lung, and Blood Institute (NHLBI) guidelines. It is interesting to note that few patients were using anti-inflammatory agents before admission although many patients were admitted or treated in the Emergency Room (ER) in the previous year. Additionally, few patients received education on home management of asthma to prevent exacerbations. The consultants concluded that there was an over-reliance on the ER for primary care, and that morbidity and costs of hospitalization could be avoided with more consistent patient education and follow-up (Collins, Goodman & McQueston, 1995).

Asthma Management Program at DGMC

The Asthma Management Program at David Grant Medical Center (DGMC) has been in place since September 1996. The objectives of the program like many others, are to reduce morbidity and mortality by a) improving knowledge among patients and their caregivers to produce better self management behavior, b) increasing compliance with therapy, c) improving relations and interactions with health care providers, and d)

increasing confidence among people with asthma in regard to controlling and managing symptoms (Sullivan, Elixhauser, Buist, Luce, Eisenberg, and Weiss, 1996). The DGMC program consists of two full-time civilian employees (nurse educator and administrative assistant) and four active duty personnel who have additional full-time duties outside the asthma program. The active duty members include the program's medical director (allergy and asthma specialist), two clinical pharmacists, and a clinical nurse. In addition to providing this service at DGMC, the asthma management staff assists regional MTFs in establishing similar asthma disease management programs.

All active duty and retirees and their respective beneficiaries are eligible for the program, with one exception; the program does not see Veterans Administration patients. Patients who are seen in the emergency department or who are hospitalized for asthma are automatically referred to the program; additionally, patients can self-refer or be referred by any health care provider.

After enrolling in the program, the patient completes a quality of life (QOL) survey and an asthma knowledge test. The asthma educator then schedules the patient (or parent) for a two-hour initial education session with the nurse educator (see Appendices A-E). Individual instruction is offered for all severe persistent asthmatics, all inpatients with an asthma or asthma-related diagnosis, parents of children under six years old, patients with scheduling difficulties and any patient who at the discretion of the educator would not do well in a group session, due to age, disability, or history of noncompliance.

Patients with mild to moderate asthma are scheduled for group classes. Classes are offered both days and evenings for a total of 2 pediatric classes and 2 adult classes per

month. Pediatric classes are limited to eight families per session. Adult classes are limited to 12 per session. The class formats and delivery of information is up to the style of the instructor. Both pediatric and adult sessions include, but are not limited to topics on asthma physiology, medications, environmental controls, proper use of peak flow meters and spacers, and asthma action plans. As such, the class covers the key points of the NHLBI Guidelines on asthma, in layman's terms (see Appendices F and G).

Each patient's physician completes and reviews an asthma action plan (see Appendix H) with each patient, based on the recommendations from the educator. Questions or concerns about complicated patients are reviewed with the medical director. The patients are seen again by an educator at six months minimum (for repeat questionnaire, QOL survey and knowledge test) and again at 12 months for repeat questionnaire completion and review of patient knowledge. The asthma program staff may consult directly with the primary provider or generate a letter with any recommendations for improved management to the primary provider for each patient seen at a follow-up appointment.

An ongoing study by Dr. Hoffman (pediatric allergist and program director), Capt Gmehlin (chief clinical pharmacist) and Ms. Rahim (asthma educator) is measuring the effectiveness of the DGMC asthma management program. The principal investigators are tracking several critical indicators including, but not limited to, the number of missed school/work days, number of ER visits, number of hospitalizations and frequency of steroid use prior to and since enrollment in the program. Figure 3 depicts preliminary results (sample size 25).

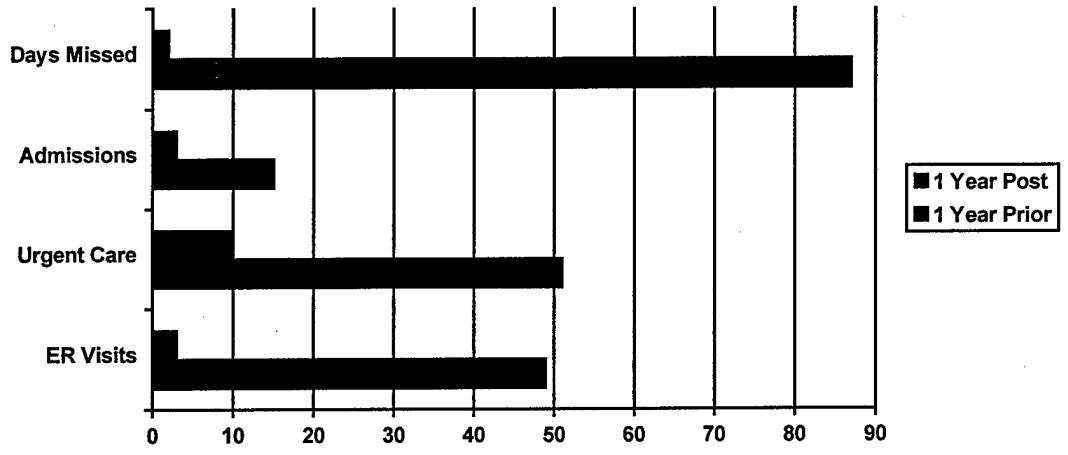


Figure 3. Preliminary Results of the DGMC Asthma Program.

## Statement of the Problem

Despite improved understanding about the treatment of asthma, morbidity and mortality due to asthma continues to rise at an alarming rate along with related health care costs (Sullivan et al.; Buist & Vollmer,1990; Weiss & Wagener, 1990). To date there are few published outcomes measurements in asthma programs based at military institutions. DGMC must actively pursue disease management initiatives such as the asthma management program, as the primary design of care delivery to improve patient outcomes and reduce the largest direct expenditure of health care cost associated with asthma: ER visits and hospitalizations.

## Literature Review

The National Asthma Education Program Expert Panel Report of 1997 points to a relatively new way of thinking about asthma and what causes an attack. In the past, asthma specialists focused on treating the symptoms of asthma and the situations they

believed caused attacks. In recent years, the emphasis has been on managing asthma as a chronic condition. Now the focus is on treating or even preventing the underlying inflammation that causes exacerbations rather than just treating its acute exacerbations or attacks (Buist & Vollmer, 1990). In fact, most exacerbations are seen as a failure of chronic management.

The challenge is therefore to identify patients at risk and to intervene appropriately to reduce their risk of hospitalization and death. Nationally, vigorous efforts are under way to educate health care providers and the lay public. The NHLBI in its National Asthma Education and Prevention Program are spearheading these efforts. The key messages of the program are that asthma is a chronic inflammatory disease, that control of environmental factors should be taken seriously, and that a partnership between patients and health care providers that include health education is a crucial component of optimal asthma management.

NHLBI guidelines include four major components: 1) pharmacological management, 2) objective measures of lung function, 3) environmental control, and 4) patient education. Proactive case management programs that incorporate these four components can produce measurable improvements in outcomes in a short period. McQueston's study (as cited in Management of Asthma, 1996) implemented such a program at the National Naval Medical Center, Bethesda, MD resulting in a 33% decrease in pediatric asthma admissions in a one year period. During the same time, a 10% increase in pediatric asthma admissions was noted at the other military treatment facilities in the Washington, D.C. area where no intervention was undertaken. Cost

analysis of the program estimated up to $200,000 savings in one fiscal year providing a dramatic example of quality improvement at reduced cost.

A 1992 study by National Jewish and John Hancock Mutual Life Insurance Co. showed that 1,300 patients with severe asthma accounted for $28 million in expenditures related to their care. Furthermore, the study identified 235 patients whose annual expenditures for care exceeded $100,000. Results of studies suggest that ER visits play a major role in driving up the cost of asthma and that appropriate disease management strategies that eliminate unnecessary ER visits can reduce asthma costs by 25%.

Zeiger (1991) in his study of a Kaiser Health Plan in San Diego compared treatment outcomes of asthma patients who came to the emergency room with acute asthma symptoms. One hundred forty-nine patients were referred to an asthma specialist and 160 continued to be treated by a primary care physician. The patients treated by the asthma specialists experienced 50% fewer asthma relapses requiring emergency room visits, a 75% reduction in the number of asthma episodes that awakened them at night, and greater use of inhaled corticosteroids. He concluded that referral of patients with asthma to specialists after acute emergency room therapy reduced asthma emergency relapses and improved asthma outcomes. The reduction in emergency room relapses could lead to reduced hospitalizations over time. The importance of such a study is further underscored by a study that found that 5% of asthmatics account for 70% of asthma-related expenditures (Bolton, 1991).

Korenblat, Korenblat-Hanin, and Gainoni (1995) found aggressive treatment at an asthma center had a positive and significant impact on asthma outcomes. The researchers

sent 180 patients of the Asthma Center in St. Louis a questionnaire to assess outcomes one year after an initial visit. Treatment at the center resulted in a 79% reduction in hospitalizations and a 76% reduction in emergency room visits for a cost saving of $787,120. Other improvements included decreases in severe shortness of breath from 50% to 14%, frequent depressed mood from 13% to 6%, and severe interference with daily activities from 29% to 11%. Patients also noted an increase from 49% to 95% in knowledge of self-care for asthma and from 21% to 79% in satisfaction with professional asthma care.

Hughes (1991) completed a two-year clinical trial involving 95 asthmatic children who measured the impact of a comprehensive home and ambulatory program for pediatric asthma management. The study subjects missed only 10.7 school days compared to 16 for the control group, and spent 3.67 days in the hospital compared to 11.2 days for the control group. The study subjects also showed significantly better small airway function after one year. More study than control families (72.1% vs. 33.1%, p=.006) reported that their asthmatic child took responsibility for asthma management. However, one year after discontinuation of the intervention program, a marked "washout" effect was observed. The researchers concluded that a comprehensive home and ambulatory program for childhood asthma management decreased illness severity and reduced hospitalizations and school absenteeism, but the program must be sustained for continued improvement.

Westley (1995) completed a retrospective study of asthma management in a Kaiser Health Plan in Denver. Seventy asthmatic patient charts were reviewed through

April of 1994. All patients (either moderate or severe asthmatics) had to be followed for at least a year by a primary care physician prior to the allergy evaluation and at least one-year of follow-up after the allergy evaluation. Physicians did all primary care, allergy evaluation and follow-up in the Kaiser Permanente system. Findings included a 68% decrease in hospitalization; a decrease in average hospital days from 4 to 2.5; a 46% decrease in sick care office visits; and a 56% decrease in emergency room visits. Estimated cost savings were $145,500.

Mahr (1993) did a retrospective study comparing 83 patients who received asthma follow-up care by an allergist and 40 patients who received care from a non-allergist after hospitalization. Only 13% of patients who received follow-up care by an allergist were subsequently hospitalized, compared to 35% treated by non-allergists. Eighteen percent of the allergist patients had emergency room visits compared to the 47% treated by non-allergists. There were significant increases in use of all medications and devices in the group treated by the allergists. He concluded follow-up care by an allergist after hospitalization for asthma resulted in a decrease in subsequent hospitalizations and emergency room visits.

Mayo (1990) measured the effect of an intensive outpatient program designed to reduce rehospitalization days for adult asthmatics. He compared 47 patients in the intensive outpatient program with 57 patients who continued to receive previous outpatient care. The program included a vigorous medical regimen and educational program with an emphasis on aggressive self-management strategies. Program enrollment resulted in a 73% reduction in readmission rates and a 63% reduction in lengths of

hospital stay during a 32-month follow-up period. He concluded a vigorous medical regimen and intensive educational program decreased hospitalization and reduced overall asthma morbidity among a group of asthmatic adults who had previously required repeated hospital admissions for acute asthma exacerbations.

Bolton, Tilley, Kuder, Reeves, and Schultz (1991) evaluated the cost effectiveness of a 12-month asthma self-management program in a sample of 241 adults who presented to an emergency department with asthma symptoms. When compared with the control group, the intervention group had fewer ER visits (39 versus 16 per 100 patients) and fewer days with activity limitations. The economic analysis showed that the $82 per person cost for the patient education program was offset by an estimated $628 per person reduction in ER charges.

During the 1980s, there were three noteworthy economic evaluations of patient education programs. In the first, Fireman, Friday, Gira, Vierthaler, and Michaels (1981) found improvement in compliance and reductions in asthma exacerbations, lost school days due to asthma, and ER and hospitalizations. The cost-benefit analysis suggested that savings from health services utilization offset costs by about 2 to 1, or about $225 per affected child.

In the second, Lewis, Rachelefsky, de la Sota, and Kaplan (1984) found that disease knowledge improved equally in the experimental group and the control group. Medication adherence was greater and ER visits and hospital days were fewer in the experimental group. Overall, the effect of the program on the children in the experimental group represented $180 savings per year per child when both program costs and benefits

were accounted.

The third was a study by Clark, Feldman, Evans, Levison, Wasilewski, and Mellins (1986) on the costs and benefits of health education in low-income families with children with asthma. The researchers found no statistically significant difference in ER visits and hospitalizations. The experimental group was found to have reduced frequency of health services utilization compared with the control group. The economic evaluation determined that, overall; benefits were less than costs by a ratio of 0.6 to 1. However, when they considered only those individuals with previous hospitalization, the benefits exceeded costs by a ratio of 11.2 to 1. They concluded that targeting interventions to high-risk patients might elicit more favorable economic results.

In summary, the economics of asthma patient education programs have been thoroughly assessed, and its economic benefits appear to be clear. Additionally, studies have illustrated important positive benefits for families and the health care community from well-conceived asthma education. However, the ability to generalize from these studies is minimal, because the patient education programs are not comparable in terms of goals and scope, and the outcome measurements, and follow-up periods vary across studies. Therefore, I wanted to take a closer look at participation in the DGMC asthma program in an effort to complement the outcome measurements (humanistic, clinical or economic) of the ongoing study. With the preliminary successes of the program so remarkable (see Figure 1), it clearly was a model for the management of other high-cost and high-volume diseases such as diabetes and hypertension.

Purpose Statement

The purpose of this project was to determine the impact the asthma program has on the number of ER visits and hospitalizations for asthma and asthma related causes. I used a linear regression model to predict the number of ER visits or hospitalizations for uncontrolled asthma based on the degree of participation of in the DGMC asthma management program.

## Methodology

The population studied was the eligible adult and pediatric beneficiaries residing in the Region 10 catchment area. This geographic area includes mid-central California, San Francisco/Oakland, Fairfield/Vacaville, Sacramento, and northern California to the Oregon border.

This study was a non-randomized, retrospective study of patients 0-30 years of age who were seen and evaluated in the DGMC ER or were hospitalized for an acute exacerbation of asthma or shortness of breath between Sept 96 and Aug 97.

I collected data in two phases. The first phase centered on collecting the following data elements from Standard Form 558 (Emergency Care and Treatment/DGMC): name of the patient; date of visit; social security number; date of birth; gender; chief complaint; and disposition. In addition, a Composite Health Care System (CHCS) ad hoc report was generated to identify those patients coded for asthma, acute asthma exacerbation, reactive airway disease (RAD) or RAD exacerbation during the prescribed timeframe. This list was then verified manually by obtaining the inpatient record to confirm that the hospitalization was in fact, the result of asthma complications.

This database was cross-referenced with the asthma program roster maintained by the administrative assistant to determine if the patient was enrolled in the management program and if so, the date of the initial class attended. Excluded from this database were patients with significant co-morbidity; patients hospitalized at other military facilities; patients no longer eligible for care; and non-acute patients triaged to evening clinics.

In the second phase of data collection, I selected individuals whose initial class date was between 1 Sept 96 and 31Mar 97 and again collected data on the number of ER visits and hospitalizations these individuals encountered from 1 Sept 97 to 31 Mar 98. Also included in the database were individuals enrolled in the asthma program who did not have an ER visit or hospitalization from Sept 96 to Aug 97. The rationale for the second phase of the data collection was to insure the database included at least 12 months of follow-up data from the date of the initial class. This issue will be addressed in more detail in the discussion section of the paper. The data was then entered into a computerized spreadsheet and then into SigmaStat for statistical analysis.

Reliability was applicable in this study in that the investigator looked at a number, in this case, ER visits and hospitalizations from an aggregate perspective rather than a patient-specific level. Reliability or consistency was essentially assumed since the information in the daily ER logs was complete and the investigator did not expect it to change. This study did not involve a measurement tool.

This type of study was exempt from the provisions of Air Force Regulation 40-403 "Clinical Investigations in Medical Research Guidance and Procedures" which requires informed consent of participants.

Predictor and Outcome Variables

The main predictor variable for this study was participation in the DGMC asthma management program. This variable assumed one of three possible values participation in the program. A larger set of predictor variables includes the variables known or thought to be related to asthma as stated in the literature review: age, gender, and rank of sponsor. The two outcome variables are the number of ER visits, and hospitalizations due to an asthma diagnosis. The variables (continuous and categorical) are coded as follows:

1. ER visits since starting the program: continuous
2. Hospitalizations since starting the program: continuous
3. Age: continuous in years
4. Sponsor's rank score:

    E-1 through E-4; 0

    E-5 through E-9; 1

    O-1 through O-3; 2

    O-4 through O-6; 3

5. Gender:

    Male; 0

    Female; 1

6. Participation:

    None; 0

    Partial (for example, attended the initial class but had erratic follow-up); 1

    Full; 2

## Results

The results indicate that greater participation in the DGMC asthma program is related to fewer number of ER visits and hospitalizations for asthma.

I approached the statistical analysis in three parts. First, a univariate analysis was conducted. Descriptive statistics of the data set for the predictor and outcome variables are provided in Table 1. Evaluation of the means points to the high accuracy of the data entry.

Table 1

Descriptive Statistics

| VARIABLE | MEAN | STANDARD DEVIATION |
|---|---|---|
| ER Visits | .8773 | .7330 |
| Hospitalizations | .0679 | .2813 |
| Age | 11.41 | 8.08 |
| Gender | .4360 | .4965 |
| Participation | .5405 | .7879 |
| Rank Score | .9050 | .6950 |

Second, a stratified analysis depicted in Figures 4-7 highlight key characteristics of the asthma population at DGMC.

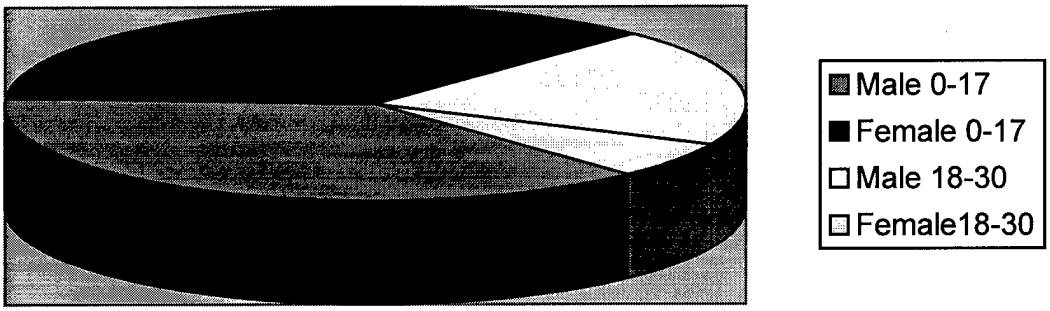


Figure 4. Demographic Characteristics of the DGMC Asthma Population

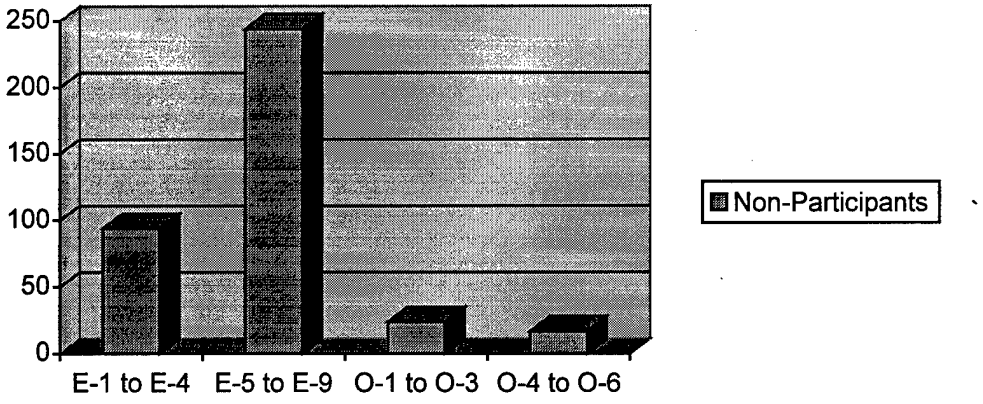


Figure 5. Non-Participants by Rank of Sponsor

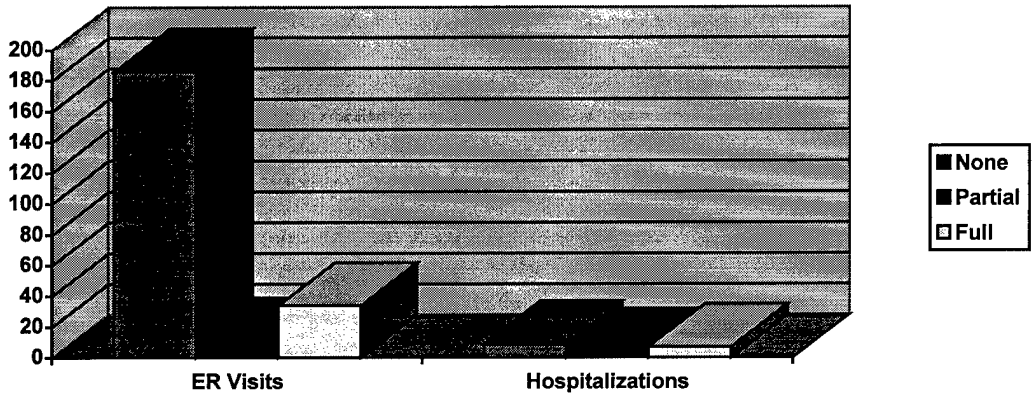


Figure 6. ER Visits and Hospitalizations in the DGMC Population Age 0-17

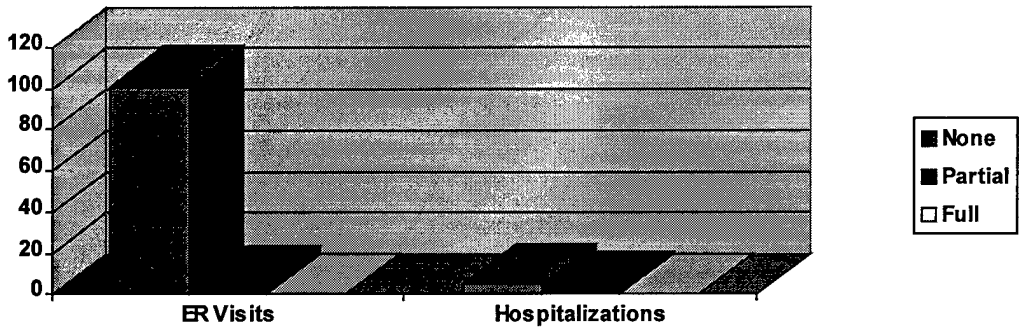


Figure 7. ER Visits and Hospitalizations in the DGMC Population Age 18-30

Third, I constructed a linear regression model by a stepwise approach to achieve the most parsimonious model of predictors of ER visits and hospitalizations due to asthma. Correlation coefficients, coefficients of determination, and F-tests were calculated to test for significance at an alpha level of .05 which served as the cutoff for retaining variables in the model (see Tables 2-4).

Table 2

Testing Significance for ER Visits

| Variable | Coefficient | t | Std Error | p |
|---|---|---|---|---|
| Constant | 1.08489 | 13.859 | .07828 | <.0001 |
| Age | .00127 | .291 | .00438 | .7712 |
| Gender | .01481 | .210 | .07068 | .8342 |
| Participation | .41355 | -9.420 | .04390 | <.0001 |
| Rank Score | .00733 | -.107 | .06869 | .9151 |

Table 3

Testing Significance for Hospitalizations

| Variable | Coefficient | t | Std Error | p |
|---|---|---|---|---|
| Constant | .04729 | 1.434 | .03297 | .1523 |
| Age | -.00127 | -.689 | .00185 | .4912 |
| Gender | .02052 | .689 | .02977 | .4911 |
| Participation | .02011 | 1.087 | .01849 | .2776 |
| Rank Score | .02440 | .843 | .02893 | .3996 |

Table 4

Inferential Statistics

| Linear Model | R-Squared | F-Ratio | df |
|---|---|---|---|
| ER Visits | .20 | 23.4 | 378 |
| Hospitalizations | .00789 | .744 | 378 |

The regression equation for prediction of ER visits for the data is:

ER = 1.0849 + .0012 (Age) +. 0148 (Gender) - .4136 (Participation) - .0073 (Rank Score).

The R-square is .20 for ER visits. This value indicated that only 20% of the variance in the ER visit data were explained by the four predictor variables selected for the ER linear regression model. Although the R-square was much lower than expected, the participation variable was statistically significant with a $p < .0001$.

The regression equation for hospitalizations for the data is:

Hos = .0473 - .0013 (Age) + .0205 (Gender) + .0201 (Participation) +. 0244 (Rank Score).

The equation for hospitalizations reveals an R-square of .0078. None of the predictor variables were statistically significant in this linear regression model. A contributing factor may be the small number of hospitalizations for the sample size.

## Discussion

I designed this research project as a retrospective study. Selection of the predictor and outcome variables was based primarily on the literature review and the readily available data that could be extracted from the SF 558s and the CHCS ad hoc reports for asthma admissions.

### Rationale for second phase of data collection

After the first data collection, I found no correlation in the statistical analysis. This led me to rethink the data analysis, specifically what the data represented. The investigator refocused on the goal: to see the impact that the asthma program has on the number ER visits and hospitalizations for asthma and asthma related causes.

I had built a database of ER visits and hospitalizations for asthma and asthma related causes for the time period 1 Sept 96 to 31 Aug 97, but the data set was incomplete. Missing were the patients who were in the program (initial class before 1 Sept 96) who *did not* show up in the ER or were hospitalized in the timeframe (approximately 25). These patients received a participation score, but a zero for number of visits/hospitalizations. Also missing were the patients who were in the program who joined *after* Sept 96. The investigator *did not* have a year's worth of follow-up data on these patients, particularly if they did not have their initial class until late in the time period. For example, if a patient did not have an initial class until July 1997, the investigator only would know if he/she had an ER visit sometime before 31 Aug 97, not

afterward.

Since an ER visit conceivably could result in a new recruit for the program, the investigator only considered those visits that took place *after* the initial class for those in the program. More importantly, to say if the program made a difference, I followed patients for a consistent time period to see how much their utilization decreased. I looked at individual patients for the 12-month period following the initial class date. Even though the time frame was different for each person depending on when they joined the program, the end result was a database that included at least 12 months of follow-up data for each subject.

I identified those patients who had been in the program for at least a year, and returned to the ER to search the records for visits from this group of patients from 1Sept 97 to 31 Mar 98. Since I knew who joined the program and when, the database was expanded to include 12 months' worth of follow-up data on all patients and therefore, enabled me to know exactly how many ER visits and hospitalizations patients had after being in the program for one full year. Expanding the database to include the above subsets of data increased the sample size to 379, thus resulting in a more complete analysis to answer the original question.

Stratified Analysis

As seen in the study by Collins, Goodman, and McQueston (1995), the distribution of asthma within DoD beneficiaries is skewed toward the pediatric population (see Figure 1) because asthma or a history of asthma renders an individual unsuitable for military service. Occasionally exceptions are made for active-duty

members with mild, intermittent disease.

Those patients seen in the ER and/or hospitalized far outnumbered those enrolled in the program during the specified time period. Approximately 65% of the sample did not participate in the program. This data was further stratified by rank of sponsor, seen in figure 2. This finding has significant implications for improved marketing of the DGMC program, especially to those sponsors in the E-5 through E-9 group. Recruitment efforts by the asthma program staff, however, were stepped up in the ER through documentation of a point of contact and telephone number on the SF 558. This documentation became more evident 3-4 months into the first phase of data collection.

There were 15 "frequent flyers" who had 3 or more visits to the ER. These patients usually have increased acuity of illness and additional psychosocial needs that are best met with a dedicated provider to their individual case. Typically, a case manager focuses on these severe or complicated patients and facilitates their movement along the entire continuum of care.

Participation in the asthma program positively translates to significant cost savings to the institution. Figures 6 and 7 are notable for the dramatic decrease in the number of ER visits and hospitalizations with just partial participation in the program. According to the Resource Management Office at DGMC, the average variable costs for an asthma ER visit and hospitalization is $58.91 and $1,113.68 respectively. Equally as important, is the slight decrease of ER utilization and hospitalizations noted between partial and full participants. This minimal return on investment suggests that the benefit of extended follow-up may not have as great an impact as providing the initial instruction

with a shorter follow-up period.

Limitations of the study

I experienced difficulty in objectively assessing participation scores based on the numerous program rosters maintained by the administrative assistant. The assistant who had very limited data management experience, was inadvertently replacing data with the most current follow-up visit. Although there was a plethora of data in each of those files, each had a slightly different format; even the headings were not consistent file to file. This system of tracking made it very difficult to extract the pertinent data on patients and objectively score participation as either partial or full. This difficulty may have contributed to the higher number of ER visits and hospitalizations seen in the full participants as compared to the partial participants seen in figure 3.

I found numerous inaccuracies in the electronic data as each hospitalization was verified with the inpatient paper record. Coding errors were common; for example, a pediatric asthmatic hospitalized with a fractured arm was entered into CHCS as an asthma admission. Consequently, significant time was spent "cleansing the data."

I found approximately 33% of the asthma hospitalizations in CHCS was incorrect. This finding has significant implications when one considers that CHCS is the database that will be used to implement HEDIS and other "report-card" systems. In addition, one known pediatric hospitalization (admitted through the ER) could not be accounted for by an inpatient record (despite numerous attempts) nor was entered into CHCS. As Todd and Tinkelman point out HEDIS performance measures, such as pediatric asthma hospitalizations will be crucial in disease management initiatives and in the development

of benchmarks with the military and civilian communities.

## Conclusions and Recommendations

Clearly, other variables should be considered in developing a more parsimonious model of predictors for ER visits and hospitalizations. Perhaps, variables such as driving distance to DGMC, TRICARE enrollment with a network provider versus a MTF provider, or frequency of steroid use would yield higher predictive values than age, gender, and rank of sponsor. However, this data collection would have required a telephonic or written survey and as previously mentioned, would have fallen outside the bounds of the original research design.

Although the current asthma program roster is packed full of significant data to measure clinical outcomes; the data is not easily extracted in its current format. This situation is critical in light of the fact that the healthcare industry and accreditation agencies are demanding that the practice of medicine be evidence-based. Hiring of a healthcare outcome researcher is being pursued to improve the tracking of outcome measurements for all future disease management programs, not only the asthma program. In the meantime, efforts are under way by the asthma management staff to convert to a "friendlier" database where the skills necessary more closely parallel the job description of an administrative assistant.

Without question, participation in the DGMC asthma program results in improved patient outcomes (evidenced by fewer ER visits and hospitalizations) and is cost-effective for this military institution. However, data quality cannot be in question if DGMC is going to build on the successes of the asthma program. Improving data entry into CHCS

and thus improving the output is a must. Only then can a healthcare researcher begin to collaborate with clinicians and administrators in the creation, collection, monitoring, analyzing and interpreting of metrics for disease management programs.

Clearly, future DGMC disease management programs will struggle, if not fail without the development of data-driven outcome measurements. Improving data integrity must be the first step toward fully implementing an enterprise-wide disease management model for healthcare delivery at the facility.

# Appendices

Appendix A. Quality of Life Survey: Adult

Appendix B. Asthma Knowledge Assessment: Adult

Appendix C. Quality of Life Survey: Pediatric

Appendix D. Asthma Knowledge Assessment: Pediatric

Appendix E. Asthma Education – Initial Instruction

Appendix F. Adult Asthma Key Points

Appendix G. Pediatric Key Points

Appendix H. Asthma Action Plan

Appendix A

**Name:** _____ **Date**_____

## QUALITY OF LIFE SURVEY - Adult

***Please circle the way you feel the majority of the time about the statements below.***

**1. My daily activities are limited because of my asthma.**

**Always Usually Sometimes Rarely Never**

**2. I avoid social situations because I am afraid of an asthma attack.**

**Always Usually Sometimes Rarely Never**

**3. I feel anxious about my asthma much of the time.**

**Always Usually Sometimes Rarely Never**

**4. I avoid exercise because I am afraid of having an asthma attack.**

**Always Usually Sometimes Rarely Never**

**5. Because of my asthma, I am in a job that I do not like.**

**Always Usually Sometimes Rarely Never**

**6. I feel socially isolated because of my asthma.**

**Always Usually Sometimes Rarely Never**

**7. Family outings and events are planned around my asthma and are not necessarily what we would choose to do if I didn't have asthma.**

**Always Usually Sometimes Rarely Never**

# ASTHMA KNOWLEDGE ASSESSMENT (Adult)

**Name:**_____ **Date**_____

***Please circle the best answer to each question below***

**1. Which change does not occur in the airways as a result of an asthma attack?**

- **a. Swelling (inflammation)**
- **b. Decreased sensitivity to things that would usually trigger an asthma attack**
- **c. Increased mucus production**
- **d. Narrowing of the airways due to muscle spasm**
- **e. No sure**

**2. Asthma is a disease that will go away with proper treatment.**

**True** **False** **Not Sure**

**3. Asthma symptoms include which of the following?**

- **a. Shortness of breath, wheezing**
- **b. Shortness of breath, wheezing, chest tightness**
- **c. Recurrent cough of more than one week**
- **d. All of the above**
- **e. None of the above**

**4. It is not necessary to treat early symptoms of an asthma attack because it may stop on its own.**

**True** **False** **Not Sure**

**5. Peak flow monitoring is information that is only useful to a doctor.**

**True** **False** **Not Sure**

**6. The medications that work to decrease the <u>swelling</u> inside your airways are:**

- **a. Inhaled corticosteroids (Azmacort, Vanceril, Beclovent, etc)**
- **b. Bronchodilators or Beta agonists (Proventil, Alupent, etc)**
- **c. Antihistamines (Claritin, Zyrtec, Deconamine, etc)**
- **d. Not sure**

7. Medications that work to relax the muscles that surround the airways are:

   a. Inhaled corticosteroids ( Azmacort, Vanceril, Beclovent, etc)
   b. Bronchodilators or Beta agonists (Proventil, Alupent, etc)
   c. Antihistamines (Claritin, Zyrtec, Deconamine, etc)
   d. Not sure

8. Examples of "triggers" or things that can cause an asthma attach are:

   a. House dust mites, animal dander, cockroaches
   b. Molds, tobacco smoke, wood smoke
   c. Strong odors and sprays
   d. Any of the above can be a trigger
   e. Not sure

9. Because you have asthma, it is not safe to exercise.

   True False Not Sure

10. You would need to go to the Emergency Room for the following problems:

   a. Gray/blue fingernails
   b. Difficulty walking or talking
   c. Peak expiratory flow less than 50% of personal best
   d. Any of the above
   e. Not sure

11. If you feel a medication is not helping or if it is causing side effect, you shoud:

   a. Inform your doctor and await instruction
   b. Stop the medication and tell your doctor at the next appointment
   c. Adjust the medication as you see fit and call the doctor when you can

12. Asthma is "all in your head."

   True False Not Sure

13. Using a peak flow meter regularly and knowing your personal best number can be helpful to you and your provider for which of the following reasons?

   a. To help you to decide if medications are working
   b. To help you to decide when to add or stop medications
   c. To help you to decide when to seek emergency care
   d. All of the above
   e. Not Sure

**14. What is the minimum decrease in peak flow that may signal the start of an asthma attack?**

a. 10-20% Green Zone
b. 20-30% Yellow Zone
c. 30-40% Yellow Zone
d. >50% Red Zone
e. Not sure

**15. After using an inhaled steroid inhaler, you should:**

a. Eat a light snack
b. Exercise to see if it's working
c. Rinse your mouth
d. Stroke your neck
e. Not sure

**16. If you have seasonal asthma, you should check your peak flow readings:**

a. Prior to and twice daily during allergy season
b. Just when you are having symptoms
c. Anytime before and after having to use your beta agonist (Proventil, Alupent)
d. A and C only
e. Not sure

**17. If you run out of bronchodilator or beta agonist (Proventil, Alupent, etc) a good over the counter substitute would be:**

a. Primatene mist
b. Primatene tablets
c. Either A or B
d. There are no safe over the counter alternatives
e. Not sure

**18. If you have asthma all year around, you should monitor your peak flows:**

a. At least once daily
b. Just when you are having symptoms
c. Anytime before and after having to use your beta agonist (Proventil, Alupent)
d. A and C only
e. Not sure

**19. Chose the statement that is true about spacers**

a. They can make using an inhaler much easier and more effective
b. They are not necessary
c. You should only use them if they come with the medication
d. None of the above
e. I do not know what a spacer is

**20. Regarding inhalers, which is the most effective way to use them?**

a. Open mouth technique
b. Closed mouth technique
c. With a spacer device
d. No one way is better than another
e. No sure

**Name:** _____ **Date**_____

## QUALITY OF LIFE SURVEY- Pediatric

***Please circle the way you feel the majority of the time about the statements below regarding the way your child's asthma affects them and/or your family life.***

**1. His/her or our daily activities are limited because of asthma.**

**Always Usually Sometimes Rarely Never**

**2. He/she or we as a family avoid social situations for fear of an asthma attack.**

**Always Usually Sometimes Rarely Never**

**3. He/she or we feel anxious about asthma much of the time.**

**Always Usually Sometimes Rarely Never**

**4. He/she or we as a family avoid exercise for fear of having/causing an asthma attack.**

**Always Usually Sometimes Rarely Never**

**5. He/she or we feel socially isolated because of asthma.**

**Always Usually Sometimes Rarely Never**

**6. Family outings and events are planned around his/her asthma and are not necessarily what we would choose to do if he/she didn't have asthma.**

**Always Usually Sometimes Rarely Never**

Appendix D

# ASTHMA KNOWLEDGE ASSESSMENT (Pediatric)

**Name:**_____ **Date**_____

***Please circle the best answer to each question below***

**1. Which change does not occur in the airways as a result of an asthma attack?**

- **a. Swelling (inflammation)**
- **b. Decreased sensitivity to things that would usually trigger an asthma attack**
- **c. Increased mucus production**
- **d. Narrowing of the airways due to muscle spasm**
- **e. No sure**

**2. Asthma is a disease that will go away with proper treatment.**

**True** **False** **Not Sure**

**3. Asthma symptoms include which of the following?**

- **a. Shortness of breath, wheezing**
- **b. Shortness of breath, wheezing, chest tightness**
- **c. Recurrent cough of more than one week**
- **d. All of the above**
- **e. None of the above**

**4. It is not necessary to treat early symptoms of an asthma attack because it may stop on its own.**

**True** **False** **Not Sure**

**5. The medications that work to decrease the swelling inside your airways are:**

- **a. Anti-inflammatories (Cromolyn, Tilade, Azmacort, Vanceril, Aerobid, etc.)**
- **b. Bronchodilators or Beta agonists (Proventil, Alupent, etc)**
- **c. Antihistamines (Claritin, Zyrtec, Deconamine, etc)**
- **d. Not sure**

**6. Medications that work to relax the muscles that surround the airways are:**

- **a. Anti-inflammatories ( Cromolyn,, Tilade, Azmacort, Vanceril, Aerobid, etc)**
- **b. Bronchodilators or Beta agonists (Proventil, Alupent, etc)**
- **c. Antihistamines (Claritin, Zyrtec, Deconamine, etc)**
- **d. Not sure**

**7. Examples of "triggers" or things that can cause an asthma attach are:**

**a. House dust mites, animal dander, cockroaches**
**b. Molds, tobacco smoke, wood smoke**
**c. Strong odors and sprays**
**d. Any of the above can be a trigger**
**e. Not sure**

**8. Because you have asthma, it is not safe to exercise.**

**True False Not Sure**

**9. You would need to go to the Emergency Room for the following problems:**

**a. Gray/blue fingernails**
**b. Difficulty walking or talking**
**c. Peak expiratory flow less than 50% of personal best**
**d. Any of the above**
**e. Not sure**

**10. If you feel a medication is not helping or if it is causing side effect, you should:**

**a. Inform your doctor and await instruction**
**b. Stop the medication and tell your doctor at the next appointment**
**c. Adjust the medication as you see fit and call the doctor when you can**

**11. Asthma is "all in your head."**

**True False Not Sure**

**12. If you run out of bronchodilator (Proventil, Alupent, etc.) a good over the counter substitute would be:**

**a. Primatene mist**
**b. Primatene tablets**
**c. Either A or B**
**d. There are no safe over the counter alternatives**
**c. Not sure**

**13. Choose the statements that is true about spacers:**

**a. They can make using an inhaler much easier and more effective**
**b. They are not necessary**
**c. You should only use them if they come with the medication**
**d. I do not know what a space**

**HEALTH RECORD** | Appendix E **CHRONOLOGICAL RECORD OF MEDICAL CARE**

| DATE | SYMPTOMS, DIAGNOSIS, TREATMENT TREATING ORGANIZATION *(Sign each entry)* |
|---|---|
| | Travis AFB, ASTHMA EDUCATION - INITIAL INSTRUCTION (Office Ext 5085-5078) |
| | Asthma Status - Mild Intermittent, Mild Persistent, Moderate Persistent, Severe Persistent (Circle One) |
| | Predicated Peak Flow Personal Best Peak Flow |
| | Current Asthma Medications |
| | |
| | |
| | The patient has been instructed in |
| | Asthma Pathophysiology Medication Use and S/E's Signs and Symptoms |
| | Asthma Triggers and Environmental Controls Peak Flow Meters Spacers |
| | Asthma Action Plans When to Call MD/Seek Care |
| | |
| | IN THE PAST YEAR, THIS PATIENT HAS HAD THE FOLLOWING: |
| | # Routine Asthma Care Visits # Urgent Care Visits # ER Visits |
| | # Admissions # Bed Days # ICU Admissions # Bed Days |
| | # School/Work Days Missed If Active Duty (or AD spouse), # of hours worked missed |
| | Patient has current Asthma Action Plan? Yes No |
| | Patient has reflux symptoms? Yes No If so, name of reflux meds |
| | Patient on immunotherapy? Yes No |
| | Initial Pre-season Test Score Initial Quality of Life Score |
| | NOTES AND RECOMMENDATIONS |
| | |
| | |
| | |

PATIENT'S IDENTIFICATION *(Use this space for Mechanical Imprint)*

| RECORDS MAINTAINED AT: ▶ | | |
|---|---|---|
| PATIENT'S NAME *(Last, First, Middle initial)* | | SEX |
| RELATIONSHIP TO SPONSOR | STATUS | RANK/GRADE |
| SPONSOR'S NAME | ORGANIZATION | |
| DEPART./SERVICE | SSN/IDENTIFICATION NO. | DATE OF BIRTH |

| DATE | SYMPTOMS, DIAGNOSIS, TREATMENT TREATING ORGANIZATION *(Sign each entry)* |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | Did the educator contact the provider or refer the patient back to the provider? If so, why? |
| | |
| | |
| | Amount of time spent in this appointment |
| | Date of next Asthma Clinic follow-up |

## ADULT ASTHMA KEY POINTS

**1. Asthma is a disease of SWELLING (INFLAMMATION), if you have been prescribed an antiinflammatory inhaler, i.e. *Azmacort, Aerobid, Vanceril (Beclovent), Intal or Tilade*, you MUST use the medication EVERY DAY, whatever number of times per day that the doctor prescribed, in order for the medication to be effective. These medicines do not work fact and in fact may take up to two weeks of regular, daily use to start working. These medications are PREVENTIVE, LONG-TERM medications and are not to be stopped when you are feeling better.**

**2. Bronchodilator inhalers, *i.e. Albuterol (Proventil) or Alupent* are QUICK RELIEF, EMERGENCY medications, taken as needed for symptoms or prior to exposure to known trigger, i.e. exercise.**

## WHEN TO CALL THE DOCTOR

**1. If you are requiring quick relief medications, (Proventil, Alupent) more than TWO TIMES PER WEEK FOR SYMPTOMS. (This does not include medicating prior to known trigger, i.e. exercise)**

**2. If you physically cannot keep up with your peers.**

**3. If you awaken frequently at night (more than once per week) because you have difficulty breathing or chest tightness.**

## WHEN TO GO TO THE DOCTOR

**1. If the emergency medications (Proventil, Alupent) are not lasting 4 hours or don't seem be working when you give them (i.e. wheezing or coughing increase after medications have had time to work, 5-10 minutes) you need to be seen.**

**2. If you are using emergency medications for symptoms around the clock for 24 hours, you need to be seen. (Unless you have just been seen and the doctor ordered it this way for a brief time because you are having an acute asthma flare-up OR if you also have emphysema and your doctor wants you to use these medications every day).**

**3. If you are having difficulty breathing (this will be up to your judgment as to whether urgent care or emergency care is more appropriate, depending on the degree of difficulty breathing).**

## WHEN TO SEEK EMERGENCY CARE

**(DON'T DRIVE, call 911 and tell them you are having TROUBLE BREATHING, or have a friend or relative drive you to the emergency room)**

**1. If you are having trouble walking or talking.**

**2. If your Peak Flow is 50% or less of your Personal Best.**

**3. If your lips or nailbeds are blue.**

**DGMC, Asthma Education, 5/97**

## PEDIATRIC ASTHMA KEY POINTS

**1. Asthma is a disease of SWELLING (INFLAMMATION), if your child has been prescribed an antiinflammatory inhaler, i.e. *Azmacort, Aerobid, Vanceril (Beclovent), Intal or Tilade*, they MUST use the medication EVERY DAY, whatever number of times per day that the doctor prescribed, in order for the medication to be effective. These medications do not work quickly, and when they are first started, it may take up to two weeks of regular, daily use to start working. These medications are PREVENTIVE, LONG-TERM medications and are not to be stopped when your child is feeling better.**

**2. Bronchodilator inhalers, *i.e. Albuterol (Proventil) or Alupent* are QUICK RELIEF, EMERGENCY medications, taken as needed for symptoms or prior to exposure to known trigger, i.e. exercise.**

### WHEN TO CALL THE DOCTOR

**1. If your child is requiring quick relief medications, (Proventil, Alupent) more than TWO TIMES PER WEEK FOR SYMPTOMS (This does not include medicating prior to known trigger, i.e. exercise) OR if there is a frequency to their episodes, i.e. every other week, once a month, or once every other month, regardless of whether it occurs all year round or just at certain times of the year.**

**2. If your child physically cannot keep up with their peers.**

**3. If your child is commonly not sleeping through the night because they are up coughing (more than once per week).**

### WHEN TO GO TO THE DOCTOR

**1. If the quick relief medications (Proventil, Alupent) are not lasting 4 hours or don't seem be working when you give them (i.e. wheezing or coughing increase after medications have had time to work, 5-10 minutes) your child needs to be seen.**

**2. If you are giving quick relief medications for symptoms around the clock for 24 hours, your child needs to be seen. (Unless your child has just been seen and the doctor ordered it this way for a brief time because they are having an asthma flare-up).**

**3. If your child is having difficulty breathing (this will be up to your judgment as to whether urgent care or emergency care is more appropriate, depending on the degree of difficulty breathing). Signs of this are:**

- **The skin over the chest and neck are pulling in (retracting) as the child breathes in**
- **The child is hunched over**
- **The child struggles to breathe**

### WHEN TO SEEK EMERGENCY CARE

**1. If your child is having trouble walking or talking or stops playing and cannot start again**

**2. If their Peak Flow is 50% or less of their Personal Best.**

**3. If their lips or nailbeds are blue.**

**IMPORTANT PHONE NUMBERS:**
**Pediatric Clinic Phone Advice: 423-5323 or 5322, Monday thru Friday, (8a to 4p)**
**After Hours, Weekend and Holiday Advice for Pediatrics and Family Practice: 423-5000**
**Asthma Education Office: 423-5085 or 5078 ( for information but not for acute breathing problems)**

# Asthma Action Plan

Name: _____ Date: _____

MD: _____ Phone: _____

Your peak flow meter is your guide to proper asthma control. The lowest daily reading determines the zone you are in for that day.

BEST PEAK FLOW = _____

**GREEN ZONE:** (80-100%) = _____ TO _____

**Great! Your asthma is well-controlled. This is where you should be every day!**

*Treatment plan:*

- ☐ Azmacort/Vanceril/Aerobid/..... ( ) puffs _____ times / day.
- ☐ Albuterol/Proventil/....., 2 puffs before exercise or every 4 hours as needed for asthma symptoms.
- ☐ Theo-Dur/Slo-Bid/Uniphyl _____ mg every 12 or ( ) hours.
- ☐ Other:

**HIGH YELLOW ZONE:** (65-80%) = _____ TO _____

**Call your MD if you keep dropping into this zone frequently.**

*Treatment plan:*

- ☐ Increase Azmacort/Vanceril/Aerobid/..... to ( ) puffs _____ times / day.
- ☐ Increase Albuterol/Proventil/....., to ( ) puffs every ( ) hours until back into green zone.
- ☐ Continue or START Theo-Dur/Slo-Bid/Uniphyl _____ mg every 12 or ( ) hours.
- ☐ Other:

**LOW YELLOW ZONE:** (50-65%) = _____ TO _____

**Call your MD if stuck in this zone!!!**

*Treatment plan:*

- ☐ Intensify Albuterol/Proventil/.....: use 2-6 puffs every 20 minutes for 1 hour, then 4-6 puffs every 2-3 hours for rapid control of asthma symptoms. You may use your nebulizer.
- ☐ Increase Azmacort/Vanceril/Aerobid/..... to ( ) puffs every ( ) hours
- ☐ Continue Theo-Dur/Slo-Bid/Uniphyl _____ mg every 12 or ( ) hours.
- ☐ If not improved in 24-48 hours, begin prednisone/Medrol* and call your MD.
- ☐ Other:

**RED ZONE:** (Below 50%) = LESS THAN _____

**THIS IS AN EMERGENCY!!!**

*Treatment plan:*

- ☐ Albuterol/Proventil/.....: use 2-6 puffs or your nebulizer every 20 minutes up to 3 times.
- ☐ Begin prednisone/Medrol*

**CALL YOUR MD! IF NOT SIGNIFICANTLY IMPROVED, GO TO THE EMERGENCY ROOM. HAVE A PLAN FOR GETTING EMERGENCY CARE QUICKLY. ALWAYS CARRY A BRONCHODILATOR MDI WITH YOU.**

* Emergency prednisone/Medrol regimen: ___ mg right away, then _____

# KEY TO SYMPTOMS

GREEN ZONE 

When you are in the green zone, your asthma is in remission. You should be able to carry on normal activities of daily living such as work, exercise, play and sleep. You should have minimal or no symptoms. Follow your treatment closely in order to stay in this zone.

YELLOW ZONE 

When you are in the yellow zone, the lining of your bronchial tubes is beginning to swell and get inflamed. Your symptoms may be very mild such as: shortness of breath on exertion, intermittent wheezing, intermittent cough which can be dry or productive. If you don't act promptly, you will experience a full fledged asthma attack. Follow the treatment plan outlined for both the high and low yellow zones and try to get back to the green zone as fast as possible.

RED ZONE 

If you are in the red zone, you are experiencing an asthma attack. This is to be taken seriously. Your symptoms may include shortness of breath at rest, severe wheezing, severe cough and/or chest pains. Staying in the red zone for too long will lead you to a true medical emergency. Follow your treatment plan and try to get to a better zone as fast as possible.

# KEY TO MEDICATIONS

1. Anti-inflammatory inhalers

   A. Steroids
   - Triamcinolone = Azmacort
   - Beclomethasone = Beclovent, Vanceril
   - Flunisolide = Aerobid

   B. Non-steroids
   - Cromolyn = Intal
   - Nedocromil = Tilade

II. Bronchodilators

   A. Short-acting
   - Albuterol = Ventolin, Proventil
   - Metaproterenol = Metaprel, Alupent
   - Terbutaline = Brethaire, Brethine, Bricanyl
   - Ipratropium bromide = Atrovent

   B. Long-acting
   - Theophylline = Theodur, Slobid, Uniphyl
   - Salmeterol = Serevent

References

Bolton, M. B., Tilley, B. C., Kuder, J., Reeves, T. & Schultz, L. R. (1991). The cost and effectiveness of an education program for adults who have asthma. Journal of General Internal Medicine, 6, 401-407.

Buist, A. S.& Vollmer, W. M. (1990). Reflections on the rise in morbidity and mortality. Journal of American Medical Association, 264, 1719-1720.

Buist, A. S. & Vollmer, W. M. (1994). Preventing deaths from asthma. New England Journal of Medicine, 331, 1584-1585.

Carr, W., Zeittel, L. & Weiss, K. (1992). Variations in asthma hospitalizations in deaths in New York City. American Journal of Public Health, 82, 59-65.

Clark, N. M., Feldman, C. H., Evans, D., Levison, M. J., Wasilewski, Y. & Mellins, R. B. (1986). The impact of health education on frequency and cost of health care use by low income children with asthma. Journal of Allergy and Clinical Immunology, 78, 108-115.

Clark, N. M., Gotsch, A. & Rosenstock, I. R. (1993). Patient, professional, and public education on behavioral aspects of asthma [ Review of the article Strategies for change and needed research ] Journal of Asthma, 30, 241-255.

Collins, P. M., Goodman, D. C. & McQueston, J.A. (1995, May). Special study on emergency and inpatient treatment of pediatric asthma in military medical treatment facilities (MTFs), September 1993 through December 1993. Rockville, MD: FMAS Corporation, Department of Defense Civillian External Peer Review Program. (Ad hoc

134.011).

Dean, A. G., Dean, J. A., Burton, A. H. & Dicker, R. C. (1991). Epi info , version 5 [Computer software]. Atlanta, GA: Centers for Disease Control.

Fireman, P., Friday, G. A., Gira, C., Vierthaler, W. A. & Michaels, L. (1981). Teaching self-management skills to asthmatic children and their parents in an ambulatory care setting. Pediatrics, 68, 341-348.

Grammer, L. C. (1992). Basic pharmacotherapy for asthma. Chest, 101 (Suppl.), 405S-406S.

Harju, T., Keistinen, T., Tuuponen, T. & Kivela, S-L. (1996). Hospital admissions of asthmatics by age and sex. Allergy, 51, 693-696.

Hoffman, K. M., Gmehlin, M. & Rahim, L. (1996). [David Grant Medical Center asthma management program]. Unpublished raw data.

Hughes, D. McLeod, M., Barr, B. & Goldbloom, R. (1991). Controlled trial of a home and ambulatory program for asthmatic children. Pediatrics, 87, 54-61.

Korenblat, P. E., Korenblat-Hanin, A. C. S. W., & Gainoni, S. J. (1995, February). Paper presented at the American Academy of Allergy and Immunology Annual Meeting.

Lewis, C. E., Rachelefsky, G., Lewis, M. A., de la Sota, A. & Kaplan, M. (1984). A randomized trial of A. C. T. (Asthma Care Training) for kids. Pediatrics, 74, 478-485.

Mahr, T. A. & Evans R. (1993). Allergist influence on asthma care. Annals of Allergy, 71, 115-120.

Management of asthma. (1996, August). PEC Update, 96, 1-B3.

Managing asthma care. (1995). Business and Health, 13 (Suppl.), 1-30.

Mayo, P. H., Richman, J. & Harris, H. W. (1990). Results of a program to reduce admissions for adult asthma. Annals of Internal Medicine, 112, 864-871.

National Asthma Education Program Expert Panel Report. (1997). Guidelines for the diagnosis and management of asthma. Bethesda, M.D.: Department of Health and Human Services.

National Heart, Lung, Blood Institute, National Institutes of Health (1995, January). Global initiative for asthma: Global strategy for management and prevention NHLBI/WHO Workshop Report (Report No. 95-3659). Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute.

Pauley, T. R., Magee, M. J. & Cury, J. D. (1995). Pharmacist-managed, physician directed asthma management program reduces emergency department visits. Annual Pharmacotherapy, 29, 5-9.

Plocher, D.W. (1996). Disease management. In P. R. Kongstvedt, The Managed Health Care Handbook (pp. 318-329). Gaithersburg, MD: Aspen Publishers, Inc.

SigmaStat Statistical Software [computer software]. (1994). Chicago, Illinois: Jandel Scientific Software.

Spitzer, W. O., Suissa, S., Ernst, P., Horwitz, R. I., Habbick, B., Cockcroft, D., Boivin, J. F., McNutt, M., Buist, A. S. & Rebuck, A. S. (1992). The use of Beta-agonist and the risk of death and near death from asthma. New England Journal of Medicine, 326, 501-506.

Sullivan, S., Elixhauser, A., Buist, A. S., Luce, B. R., Eisenberg, J. & Weiss, K.

B. (1996). National asthma education and prevention program working group report on the cost effectiveness of asthma care. American Journal of Respiratory Critical Care Medicine, 154, 584-595.

Todd, W. E. & Tinkelman, D. G. (1996). Asthma disease management. Medical Scientific, 13 (Suppl.), 1-5.

Weiss, K. B., Gergen, P. J. & Hodgson, T. A. (1992). An economic evaluation of asthma in the United States. New England Journal of Medicine, 326, 862-866.

Weiss, K. B., Gergen, P. J. & Wagener, D. K. (1993). Breathing better or wheezing worse? Then changing epidemiology of asthma morbidity and mortality. Annual Review of Public Health, 14, 491-513.

Weiss, K. B., & Wagener, D. K. (1990). Changing pattern of asthma mortality: Identifying target populations at risk. Journal of American Medical Association, 264, 1683-1687.

Westley, C. R., Marsh, W., Comer, C., Sanders, B., Harvey, R. & Spiecher, B. (1995). Cost effectiveness of an allergy consultation in the management of asthma. Annals of Allergy, 74, 54.

Zeiger, R. S., Heller, S., Mellon, M. H., Wald, J., Falkhoff, R. & Schatz, M. (1991). Facilitated referral to asthma specialist reduces relapses in asthma emergency room visits. Journal of Allergy and Clinical Immunology, 87, 1160-1168.